

WHAT IS CLAIMED IS:

1 1. An integrated tunable sensing apparatus for electromagnetic radiation,
2 the sensing apparatus comprising:
3 a substrate, the substrate comprising a backside and a face;
4 a tunable cavity region coupled to the backside of the substrate;
5 an elastic material forming a region including the tunable cavity region;
6 a first reflection device within a first portion of the tunable cavity region;
7 a second reflection device within a second portion the cavity region and facing
8 the first reflection device;
9 a movable gap formed between the first reflection device and the second
10 reflection device within the tunable cavity region;
11 an actuation device coupled to the tunable cavity region, the actuation device
12 being adapted to cause movement from a first predetermined spatial dimension to a second
13 predetermined spatial dimension of the movable gap;
14 a detection device coupled to the tunable cavity.

1 2. The apparatus of claim 1 wherein the sensing device comprises one of
2 the reflection devices.

1 3. The apparatus of claim 1 wherein electromagnetic radiation is IR.

1 4. The apparatus of claim 1 wherein the first predetermined spatial
2 dimension ranges from about 1.5 Microns to about 4 Microns.

1 5. The apparatus of claim 1 wherein the second predetermined spatial
2 dimension ranges from about 2.5 Microns to about 8 Microns.

1 6. The apparatus of claim 1 wherein the detection device is a sensing
2 device.

1 7. The apparatus of claim 1 wherein the detection device is a sensing
2 device.

1 8. The apparatus of claim 1 further comprising a drive device coupled to
2 the actuation device.

1 9. The apparatus of claim 1 further comprising a control device coupled
2 between the detection device and drive device.

1 10. The apparatus of claim 1 the substrate comprises a silicon wafer.

1 11. The apparatus of claim 1 wherein the detection device is adapted to
2 capture information associated with a selected wavelength range within an IR range of
3 electromagnetic radiation having the selected wavelength range, the electromagnetic
4 radiation having the selected wavelength range having a resonating characteristic between the
5 first reflection device and the second reflection device within the tunable cavity region.

1 12. The apparatus of claim 11 wherein the selected wavelength range is
2 selected from 3-5 Microns and 8-14 Microns.

1 13. The apparatus of claim 12 wherein tunable cavity region is free from
2 electromagnetic radiation outside of the selected wavelength range having a resonating
3 characteristic.

1 14. The apparatus of claim 13 wherein the movable gap is maintained at
2 the second predetermined spatial dimension to provide the resonating characteristic of the
3 electromagnetic radiation between the first reflection device and the second reflection
4 device.

1 15. The apparatus of claim 1 wherein the substrate, the elastic material,
2 first reflection device, second reflection device, movable gap, actuation device and detection
3 device are enclosed in a package, the package having a window region facing the backside of
4 the substrate, the window region being adapted to allow electromagnetic radiation to traverse
5 there through.

1 16. The apparatus of claim 15 wherein the package provides a vacuum in
2 the tunable cavity.

1 17. A method for sensing electromagnetic radiation having a
2 predetermined spatial frequency, the method comprising:
3 providing a tunable cavity region, the tunable cavity region comprising an
4 elastic material forming a region including the tunable cavity region, the tunable cavity

5 region having a first reflection device within a first portion of the tunable cavity region and
6 having a second reflection device within a second portion the cavity region and facing the
7 first reflection device, the tunable cavity region having a movable gap formed between the
8 first reflection device and the second reflection device within the tunable cavity region;
9 moving the movable gap from a first predetermined spatial dimension to a
10 second predetermined spatial dimension using an actuation device coupled to the tunable
11 cavity region;
12 causing a resonating characteristic of a selective wavelength corresponding to
13 an IR band of electromagnetic radiation between the first reflection device and the second
14 reflection device within the tunable cavity while being maintained at the second
15 predetermined spatial dimension;
16 preventing one or more wavelengths outside of the selected wavelength from
17 achieving the resonating characteristic between the first reflection device and the second
18 reflection device while being maintained at the second predetermined spatial dimension; and
19 capturing information associated with the selected wavelength using a
20 detection device coupled to the tunable cavity region.

1 18. The method of claim 17 wherein the sensing device comprises one of
2 the reflection devices.

1 19. The method of claim 17 wherein electromagnetic radiation is IR
2 radiation.

1 20. The method of claim 17 wherein the first predetermined spatial
2 dimension ranges from about 2.5 Microns to about 7 Microns.

1 21. The method of claim 17 wherein the second predetermined spatial
2 dimension ranges from about 1.5 Microns to about 4 Microns.

1 22. The method of claim 17 wherein the detection device is a sensing
2 device.

1 23. The method of claim 17 wherein the elastic member is Parylene.

1 24. The method of claim 17 where the actuation device is coupled to a
2 drive device.

1 25. The method of claim 17 wherein the selected wavelength range is
2 selected from 3-5 Microns to 8-14 Microns.

1 26. A method for manufacturing a bolometer device, the method
2 comprising:
3 providing a substrate;
4 forming a first reflection layer overlying the substrate;
5 forming a first electrode layer overlying the substrate;
6 forming a sacrificial layer overlying a portion of the first reflection layer and a
7 portion of the first electrode layer;
8 patterning the sacrificial layer, the patterned sacrificial layer corresponding to
9 a cavity region;
10 forming a second electrode layer overlying the sacrificial layer;
11 forming an elastic layer overlying the patterned sacrificial layer, the elastic
12 polymer layer enclosing the cavity region corresponding to the patterned sacrificial layer; and
13 releasing the sacrificial layer to form an opening in the cavity region.

1 27. The method of claim 26 wherein the substrate comprises a silicon
2 wafer.

1 28. The method of claim 26 wherein the first reflection layer comprises a
2 mirror layer.

1 29. The method of claim 26 wherein the sacrificial layer comprises a
2 polysilicon, an amorphous silicon, and photoresist.

1 30. The method of claim 26 wherein the elastic layer is selected from a
2 Parylene, a polyimide, or SU-8.

1 31. The method of claim 26 wherein the second electrode layer is a second
2 reflection layer.

1 32. The method of claim 26 further comprising forming a metal layer
2 overlying the elastic layer.

1 33. The method of claim 26 further comprising forming a layer selected
2 from vanadium oxide, amorphous silicon, or an ion-implanted polymer overlying the elastic
3 layer.

1 34. The method of claim 26 wherein the cavity region is characterized by a
2 gap, the gap having a dimension ranging from about 1.5 microns to about 7 microns.

1 35. The method of claim 26 wherein the bolometer device is tunable.

1 36. The method of claim 26 wherein the first electrode layer forms a more
2 than one of electrode device.